AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. – 15 (canceled)

16. (previously presented)An inspection system for use in inspecting flat panel displays comprising:

an optical array including a staring array optical sensor for viewing a flat panel display substrate; and

an illumination subsystem sequentially providing dark field and bright field illumination of said flat panel display substrate when said optical array views at least a part of said flat panel display substrate.

17. (original) An inspection system according to claim 16 and wherein said illumination subsystem provides various combinations of dark field and bright field illumination of said flat panel display substrate when said optical array views said flat panel display substrate.

18. (original) An inspection system according to claim 17 and wherein said dark field and said bright field illumination are diffuse.

19. (original) An inspection system according to claim 17 and wherein said dark field and said bright field illumination are focussed.

20. (original) An inspection system according to claim 19 and wherein said flat panel display substrate has a surface that includes a periodic spatial feature, and said dark field and said bright field illumination are diffracted by said spatial feature.

21. (previously presented) An inspection system according to claim 17 and also comprising a spatially positionable stage to support the flat panel display substrate, wherein the stage spatially positions the substrate at various angles relative to the illumination subsystem.

22. (currently amended) An inspection system according to claim 21 and wherein the optical array, illumination subsystem and stage are configured and arranged to selectively enable viewing the flat panel display substrate such that a non-zero'th order of diffraction impinges on the ~~non-scanning optical array~~ staring array optical sensor.

23. (currently amended) An inspection system according to claim 22 and wherein a multiplicity of the non-zero'th orders of diffraction ~~of a similar order~~ impinge on said ~~non-scanning optical array~~ staring array optical sensor.

24. (currently amended) An inspection system according to claim 22 and wherein the optical array, the illumination subsystem and the stage are configured and arranged to additionally enable selectively viewing the flat panel display substrate such that a zero'th order of diffraction impinges on the ~~non-scanning optical array~~ staring array optical sensor.

25. (currently amended) An inspection according to claim 22 and wherein the optical array the illumination subsystem and the stage are configured and arranged to additionally enable selective viewing of the flat panel display substrate such that substantially no orders of diffraction impinge on the ~~non-scanning optical array~~ staring array optical sensor.

26. (original) An inspection system according to claim 25 and wherein the optical array and the illumination subsystem are configured and arranged to sequentially view the flat panel display substrate and wherein in one view a selected non-zero'th order of diffraction impinges on the optical array, and in other each sequential views at least one of the following impinges on the optical array: a zero'th order of diffraction, an additional selected non-zero'th order of diffraction, no order of diffraction, the same non-zero'th order of diffraction of a different region of the article.

27. (currently amended) An inspection system according to claim 16 and also comprising an image analyzer receiving an output from said ~~non-scanning optical array~~ staring array optical sensor and being operative to detect process defects including at least one of: uneven deposition of coatings, uneven removal of coatings, rinse residues, chemical residues, incomplete exposure of a photo-resist deposited on the substrate, scratches, lines, and particles embedded in the substrate.

28. (previously presented) An inspection system according to claim 17 and wherein said optical array views substantially all of a surface of said substrate.

29. (previously presented) An inspection system according to claim 17 and wherein said optical array views only part of a surface of said substrate.

30. (previously presented) An inspection system according to claim 17 and wherein said optical array acquires at least one image of said substrate for each of a plurality of different illuminations.

31. (original) An inspection system according to claim 27 in which an image analyzer identifies said defects by computer analysis of a plurality of images of said substrate taken under differing illumination.

32. – 34. (canceled)

35. (previously presented) An inspection system according to claim 17 and also comprising a light source and a reflector operative to provide concentrated light from the light source to at least part of said flat panel display substrate.

36. (original) An inspection system according to claim 35 wherein said reflector has two points of focus, and wherein a projector is situated at a first of points of focus, and the second point of focus is situated away from the flat panel display substrate.

37. (original) An inspection system according to claim 36 and wherein the reflector is a section of an ellipsoid.

38. (original) An inspection system according to claim 36 and wherein the reflector is flat and is operatively associated with a lens.

39. (original) An inspection system according to claim 38 and wherein the lens is a fresnel lens attached to the reflector.

40. – 41. (canceled)

42. (currently amended) An inspection system according to claim 17 and comprising an adjustable mounting assembly for selectable ~~detennining~~ determining at least one of relative inclination, spatial separation and axial orientation of at least two of said optical array, said illumination subsystem and said substrate.

43. – 69. (canceled)

70. (currently amended) Apparatus for optically inspecting a substantially planar surface of an article, comprising:

an inspection region;

an illuminator configured to selectably illuminate a substantially planar surface of an article located in the inspection region with one of at least two predetermined configurations of illumination, a first configuration of illumination providing dark field illumination and a second configuration of illumination providing bright field illumination;

an image acquisition sub-system comprising at least one camera having a two dimensional field of view for acquiring images of generally the entire surface of the article when illuminated by at least one of said predetermined configurations of illumination; and

an image analysis subsystem for computer analysis of the images and detecting anomalies in the surface as a function of variations in reflected intensities of illumination.

71. (original) Apparatus for optically inspecting the surface of an article according to claim 70 and also comprising a spatially positionable stage for supporting the article in the inspection region in selectable orientation relative to the illumination apparatus.

72. (previously presented) Apparatus for optically inspecting the surface of an article according to claim 70, wherein the image analysis subsystem is operative to identify anomalies that are substantially at least as large as the resolution of the camera.

73. (currently amended) Apparatus for coating an article having a substantially planar surface, comprising:

a coating generator operative to generate a coating on a surface of the article;

an illuminator configured to selectably ~~illuminating~~ illuminate said surface bearing said coating with one of at least two predetermined configurations of illumination, a first configuration of illumination providing dark field illumination and a second configuration of illumination providing bright field illumination;

an image acquisition sub-system comprising at least one sensor having a two dimensional field of view for acquiring images of generally the entire surface of the article for each combination of illumination; and

an image analysis subsystem for analyzing the images and detecting anomalies in the surface on the basis of variations in reflected intensities of illumination.

74. – 88. (canceled)

89. (previously presented) A method for inspecting flat panel displays comprising:

viewing a flat panel display substrate using an optical array, including a staring array camera; and

sequentially illuminating said flat panel display substrate with dark field and bright field illumination when said optical array views said flat panel display substrate, to obtain darkfield and brightfield images for substantially the entire flat panel display substrate.

90. (original) A method according to claim 89 and wherein said sequentially illuminating step illuminates using various combinations of dark field and bright field

illumination of said flat panel display substrate when said optical array views said flat panel display substrate.

91. (original) A method according to claim 90 and also comprising:
supporting the substrate with a spatially positionable stage, and spatially positioning the stage at various angles to illuminate the substrate with dark field and bright field illumination.

92. (currently amended) A method according to claim 90 and also comprising:
receiving an output from said ~~non-scanning optical array~~ staring array camera; and

detecting process defects including at least one of: uneven deposition of coatings, uneven removal of coatings, rinse residues, chemical residues, incomplete exposure of a photo-resist deposited on the substrate, scratches, lines, and particles embedded in the substrate.

93. (previously presented)A method according to claim 89 and wherein said viewing step comprises viewing substantially all of a surface of said substrate.

94. (previously presented)A method according to claim 89 and wherein said viewing step comprises acquiring at least one image of said substrate for each of a plurality of different illuminations.

95. (original) A method according to claim 92 and wherein said detecting step comprises identifying said defects by computer analysis of a plurality of images of said substrate taken under differing illumination.

96. (previously presented)A method according to claim 89 and also comprising providing an enclosure containing a first plurality of illuminators mounted on one wall thereof and a second plurality of illuminators mounted on a second wall thereof.

97. (original) A method according to claim 96 and wherein said providing step also comprises providing a third illuminator mounted on a third wall of said enclosure.

98. (previously presented)A method according to claim 89 and also comprising providing a diffuser associated with said illumination subsystem.

99. (previously presented)A method according to claim 89 and also comprising providing an adjustable mounting assembly for selectably determining at least one of relative inclination, spatial separation and axial orientation of at least two of said optical array, said illumination subsystem and said substrate.

100. (previously presented)A method for inspecting objects comprising:

a) viewing a first location on an object using an optical array comprising a staring array sensor;

b) sequentially illuminating said first location with dark field and bright field illumination when said optical array views said object; and

c) repeating operations (a) and (b) to obtain images illuminated by said dark field and bright field illumination for additional locations together comprising substantially the entire object.

101. (previously presented)A method according to claim 100 and wherein said sequentially illuminating step illuminates using various combinations of dark field and bright field illumination of said object when said optical array views said object.

102. (previously presented)A method according to claim 101 and also comprising:

receiving outputs from said optical array; and

detecting process defects including at least one of: uneven deposition of coatings, uneven removal of coatings, rinse residues, chemical residues, incomplete exposure of a photo-resist deposited on the substrate, scratches, lines, and particles embedded in the substrate.

103. (previously presented)A method according to claim 100 and wherein said viewing comprises viewing substantially all of a surface of said object.

104. (previously presented)A method according to claim 100 and wherein said viewing comprises acquiring at least one image of said object for each of a plurality of different illuminations.

105. (previously presented)A method according to claim 102 and wherein said detecting comprises identifying said defects by computer analysis of a plurality of images of said object taken under differing illumination.

106. (previously presented)A method according to claim 100 and also comprising providing an enclosure containing a first plurality of illuminators mounted on one wall thereof and a second plurality of illuminators mounted on a second wall thereof.

107. (original) A method according to claim 106 and wherein said providing step also comprises providing a third illuminator mounted on a third wall of said enclosure.

108. (previously presented)A method according to claim 100 and also comprising providing a diffuser associated with said illumination subsystem.

109. (previously presented)A method according to claim 100 and also comprising providing an adjustable mounting assembly for selectably determining at least one of relative inclination, spatial separation and axial orientation of at least two of said optical array, said illumination subsystem and said object.

110. (currently amended) A method for optically inspecting the surface of an article having a substantially planar surface, comprising:

a) defining an inspection region;

b) ~~selectably~~ sequentially illuminating a surface of an article located in the inspection region with at least two predetermined configurations of illumination, a first configuration of illumination providing dark field illumination and a second configuration of illumination providing bright field illumination;

c) acquiring images of the surface of the article when illuminated by at least one predetermined configuration of illumination using at least one staring array camera;

d) moving said article or said camera so that a next part of said surface is located in said inspection region and repeating operations (b) & (c) until images of substantially all of said surface are acquired; and

e) analyzing the images and detecting anomalies in the surface as a function of variations in reflected intensities of illumination.

111. (original) A method for optically inspecting the surface of an article according to claim 110 and also comprising supporting the article on a spatially positionable stage in the inspection region, and selectably spatially orienting the stage relative to a predetermined configuration of illumination.

112. (currently amended) A method for optically inspecting the surface of an article according to claim 110, wherein said analyzing is operative to identify anomalies that are substantially the same size as the resolution of the said staring array camera.

113. (currently amended) A method for coating an article having a substantially planar surface, comprising:

generating a coating on a surface of the article;

~~selectably~~ sequentially illuminating said surface bearing said coating with at least two predetermined configurations of illumination, a first configuration of illumination providing dark field illumination and a second configuration of illumination providing bright field illumination;

acquiring images of the surface of the article for each combination of illumination using at least one staring array sensor; and

analyzing the images and detecting anomalies in the surface on the basis of variations in reflected intensities of illumination.

114. (canceled)

115. (previously presented)A method for inspecting the surface of an article, comprising the steps of:

placing the article in an inspection region defined by a stage;

illuminating a portion of the surface of the article with at least one configuration of dark field illumination;

acquiring at least one image illuminated under said at least one configuration of dark field illumination, said at least one image covering substantially the entire surface;

illuminating the surface with at least one configuration of at least substantially bright field illumination;

acquiring at least one image, said at least one image covering substantially the entire surface, illuminated under said at least one configuration of at least substantially bright field illumination; and

analyzing the images by computer to determine non uniformities in reflected intensities.

116. (original) The method of claim 115 in which the at least one configuration of dark field illumination comprises a plurality of dark field illumination combinations, and separate images are acquired for each of the combinations.

117. (original) The method of claim 115 in which the at least one configuration of substantially bright illumination comprises a plurality of bright field illumination combinations, and separate images are acquired for each of the combinations.

118. (original) The method of claim 117 comprising the additional step of selecting for each predetermined combination of illumination a predetermined inclination and orientation of the substrate, and acquiring separate images of the surface for each said inclination and axial orientation.

119. (original) The method of claim 115 comprising the additional step of optically treating the illumination prior to acquiring an image.

120. (original) The method of claim 119 in which the treatment is provided by optical filters.

121. (original) The method of claim 120 in which the optical filters filter light at all but selected wavelengths.

122. (original) The method of claim 120 in which the filters filter light to transmit light having a selected polarization.

123. (original) The method of claim 119 in which the surface is illuminated with a selected combination of broad spectrum illumination and imaged through an optical filter operative to transmit light in a first predetermined spectral range, and subsequently imaged through an optical filter operative to transmit light in a second predetermined spectral range.

124. (original) The method of claim 119 in which the surface is illuminated with a first combination illumination provided in first predetermined spectral range and imaged, and subsequently illuminated with a second combination of illumination provided in a second predetermined spectral range and imaged.

125. (original) The method of claim 119 in which the surface is illuminated with a selected combination of broad spectrum illumination and imaged through an optical filter operative to transmit light in a first predetermined polarization, and subsequently imaged through an optical filter operative to transmit light having a predetermined polarization.

126. (original) The method of claim 119 in which the surface is illuminated with a first combination of illumination having a first predetermined polarization and imaged, and subsequently illuminated with a second combination of illumination having a second predetermined polarization and imaged.

127. (original) The method of claim 115 comprising the additional step of blurring the image during acquisition.

128. (original) The method of claim 127 in which the at least one image is blurred by introducing relative movement between at least two of the following: the surface, the camera, and an optical element between the surface and the camera.

129. (original) The method of claim 115 comprising the further step of analyzing said nonuniformities by computer to determine the presence of defects in coatings on the substrate.

130. (original) The method of claim 115 in which the article is a flat display panel substrate.

131. (previously presented)A method for coating the surface of an article with a film, comprising:

depositing a film coating on at least part of a surface of the article;

placing the article in an inspection region;

illuminating a portion of the coated surface of the article with at least one configuration of dark field illumination;

acquiring an image of the surface illuminated by the at least one configuration of dark field illumination;

illuminating the surface with at least one configuration of substantially bright field illumination;

acquiring an image of the entire surface illuminate by the least one configuration of substantially bright field illumination; and

analyzing each image by computer to determine non uniformities in reflected intensities.

132. – 146. (canceled)

147. (original) A method according to claim 89 and wherein said dark field and said bright field illumination are diffuse.

148. (original) A method according to claim 89 and wherein said dark field and said bright field illumination are focussed.

149. (original) A method according to claim 148 and wherein said flat panel display substrate has a surface that includes a periodic spatial feature, and said dark field and said bright field illumination are diffracted by said spatial feature.

150. (currently amended) A method according to claim 99 and wherein the optical array, illumination subsystem and stage are configured and arranged to selectively enable viewing the flat panel display substrate such that a non-zero'th order of diffraction impinges on the ~~non-scanning optical array~~ staring array camera.

151. (currently amended) A method according to claim 150 and wherein a multiplicity of the non-zero'th orders of diffraction ~~of a similar order~~ impinge on said ~~non-scanning optical array~~ staring array camera.

152. (currently amended) A method according to claim 150 and wherein the optical array, the illumination subsystem and the stage are configured and arranged to additionally enable selectively viewing the flat panel display substrate such that a zero'th order of diffraction impinges on the ~~non-scanning optical array~~ staring array camera.

153. (currently amended) A method according to claim 150 and wherein the optical array the illumination subsystem and the stage are configured and arranged to additionally enable selective viewing of the flat panel display substrate such that substantially no orders of diffraction impinge on the ~~non-scanning optical array~~ staring array camera.

154. (original) A method according to claim 153 and wherein the optical array and the illumination subsystem are configured and arranged to sequentially view the flat panel display substrate and wherein in one view a selected non-zero'th order of diffraction impinges on the optical array, and in other each sequential views at least one of the following impinges on the optical array: a zero'th order of diffraction, an additional selected non-zero'th order of diffraction, no order of diffraction, the same non-zero'th order of diffraction of a different region of the article.

155. (previously presented)A method according to claim 89 and also comprising providing a light source and a reflector operative to provide concentrated light from the light source to at least part of said flat panel display substrate.

156. (original) A method according to claim 155 wherein said reflector has two points of focus, and wherein a projector is situated at a first of points of focus, and the second point of focus is situated away from the flat panel display substrate.

157. (original) A method according to claim 156 and wherein the reflector is a section of an ellipsoid.

158. (original) A method according to claim 156 and wherein the reflector is flat and is operatively associated with a lens.

159. (original) A method according to claim 158 and wherein the lens is a fresnel lens attached to the reflector.

160. (previously presented)A method according to claim 89 and also comprising providing a light source and a lens operative to provide concentrated light from the light source to at least part of said flat panel display substrate.

161. (original) A method according to claim 160 wherein the projector is situated at a first focus of the lens, and a second focus of the lens is situated away from the flat panel display substrate.

162. (original) A method according to claim 90 and wherein said dark field and said bright field illumination are diffuse.

163. (original) A method according to claim 90 and wherein said dark field and said bright field illumination are focussed.

164. (original) A method according to claim 163 and wherein said surface includes a periodic spatial feature operative to diffract light impinging thereon.

165. (previously presented)A method according to claim 89 and also comprising providing a spatially positionable stage to support the article, wherein the stage spatially positions the article at various angles relative to the illumination subsystem.

166. (currently amended) A method according to claim 165 and wherein the optical array, illumination subsystem and stage are configured and arranged to selectively enable viewing the surface such that a non-zero'th order of diffraction impinges on the ~~non-scanning optical array~~ staring array camera.

167. (currently amended) A method according to claim 166 and wherein a multiplicity of non-zero'th orders of diffraction of substantially the same order impinge on the ~~non-scanning optical array~~ staring array camera.

168. (currently amended) A method according to claim 166 and wherein the optical array, the illumination subsystem and the stage are configured and arranged to additionally enable selectively viewing of the surface such that a zero'th order of diffraction impinges on the ~~non-scanning optical array~~ staring array camera.

169. (currently amended) A method according to ~~any of claims 166-168~~ claim 166 and wherein the optical array the illumination subsystem and the stage are configured and arranged to additionally enable selectively viewing the object such that substantially no orders of diffraction impinge on the ~~non-scanning optical array~~ staring array camera.

170. (original) A method according to claim 169 and wherein the optical array, the illumination subsystem and the stage are configured and arranged to sequentially view the object and wherein in one view a selected non-zero order of diffraction impinges on the optical array, and in other sequential views at least one of the following impinges on the optical array: a zero'th order of diffraction, an additional non-zero'th order of diffraction, the same non-zero'th order of diffraction of a different region of the surface of the article, and no order of diffraction.

171. (previously presented)A method according to claim 89 and wherein said optical array views only a part of a surface of said substrate.

172. (previously presented)A method according to any of claim 89 and also comprising providing a light source and a reflector operative to provide concentrated light from the light source to at least part of said surface.

173. (original) A method according to claim 172 wherein said reflector has two points of focus, and wherein a projector is situated at a first focus, and a second focus is situated not on the surface.

174. (original) A method according to claim 173 and wherein the reflector is a section of an ellipsoid.

175. (original) A method according to claim 174 and wherein the reflector is flat and is operatively associated with a lens.

176. (original) A method according to claim 175 and wherein the lens is a fresnel lens attached to the reflector.

177. (previously presented)A method according to claim 89 and also comprising providing a light source and a lens operative to provide concentrated light from the light source to at least part of said flat panel display substrate.

178. (original) A method according to claim 177 providing a projector which is situated at a first focus of the lens, and a second focus of the lens is situated not on the flat panel display substrate.